

Parabola Boundary Zones

Write quadratic inequalities from graphs and contexts.

HIGH SCHOOL • MA.912.AR.3.9

MA.912.AR.3.9 "Given a mathematical or real-world context, write two-variable quadratic inequalities to represent relationships between quantities from a graph or a written description."

NAME _____

DATE _____

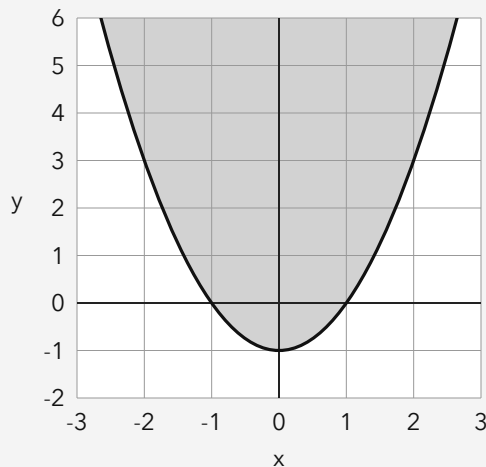
You will need: Pencil; Ruler

READ THE BOUNDARY

A parabola can be a boundary written as $y = f(x)$. Use $\geq$ or $\leq$ for a solid boundary, and use $>$ or $<$ for a dashed boundary. Choose the sign by whether the shaded region is above or below the parabola.

WORKED EXAMPLE

Write the quadratic inequality represented by the graph.

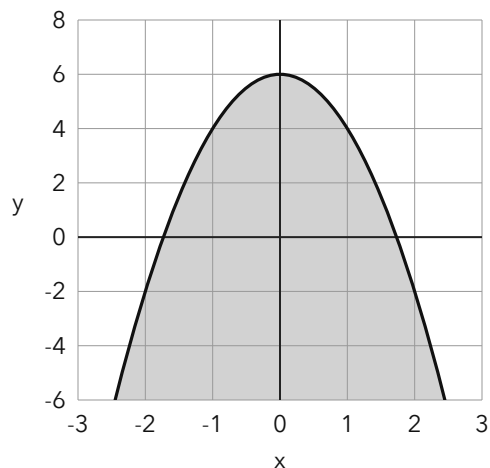


1. The curve has equation $y = x^2 - 1$.
2. The solid boundary means the curve is included.
3. The shaded side is above the curve, so use $\geq$.

Answer: $y \geq x^2 - 1$

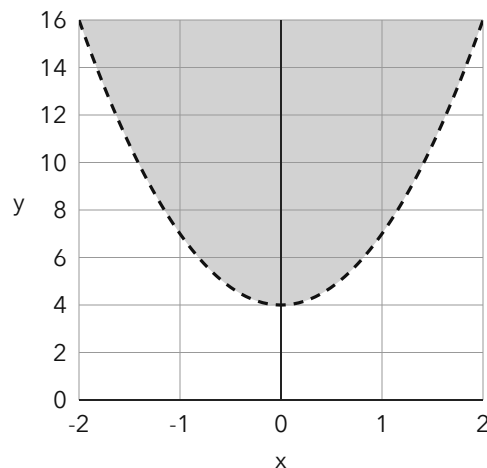
PRACTICE 4 problems

- 1** Write the quadratic inequality represented by this graph. Use the vertex and another grid point to find its boundary.



ANSWER _____

- 2** Write the quadratic inequality represented by this graph. Use the vertex and another grid point to find its boundary.



ANSWER _____

- 3** The boundary $y = -4x^2 - 6$ is solid. Points on or above the boundary are allowed. Write the inequality.

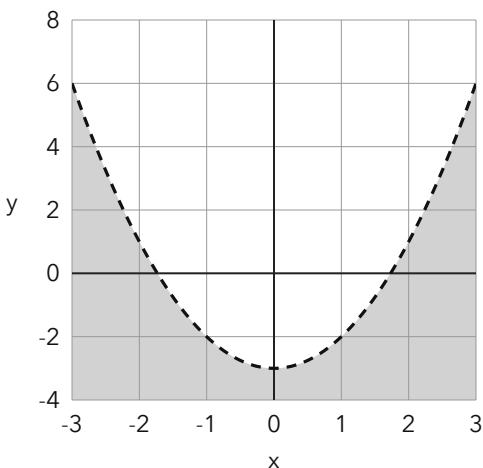
ANSWER _____

- 4** A design region includes points strictly below $y = 5x^2 - 7$. Write the inequality.

ANSWER _____

APPLY IT Show your work**1**

On a game map, x is horizontal tiles and y is vertical tiles. The graph shows the bonus zone. Write its quadratic inequality.

**REASONING AND ANSWER**

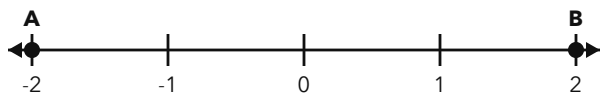
2

For a skate video effect, x is horizontal meters from a ramp and y is height in meters. The visible region is on or below the solid path $y = -2x^2 + 8$. Write the inequality.

WORK SPACE**REASONING AND ANSWER**

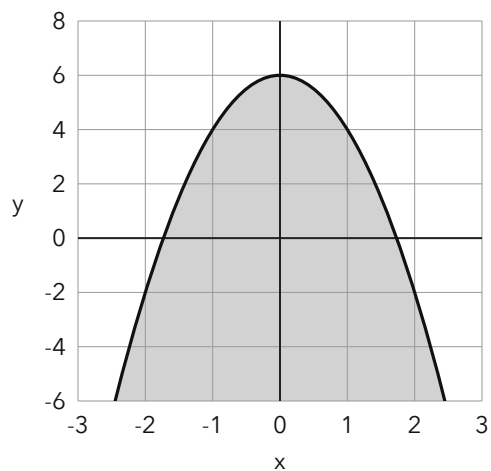
CHALLENGE One step up

The number line shows the allowed x -values for a virtual tunnel, with endpoints included. Its dashed ceiling is $y = -3x^2 + 12$, and the play zone is below it. Write both inequalities.

**WORK SPACE AND ANSWER**

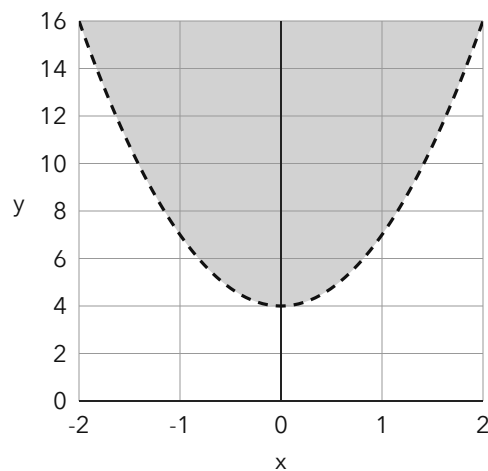
PRACTICE 1

$$y \leq -2x^2 + 6$$



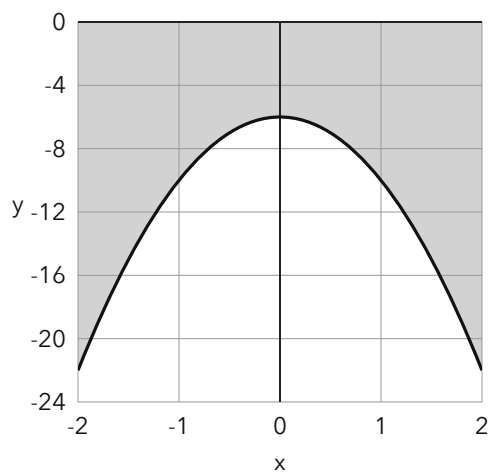
PRACTICE 2

$$y > 3x^2 + 4$$



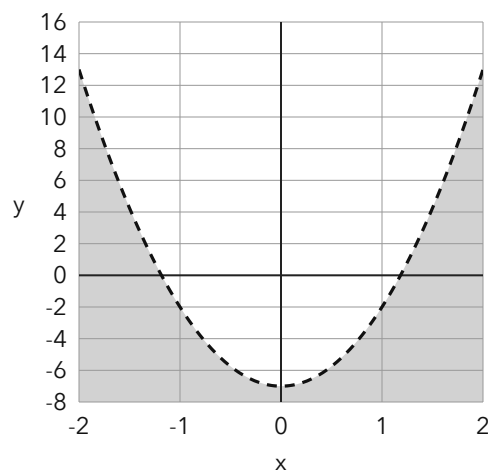
PRACTICE 3

$$y \geq -4x^2 - 6$$



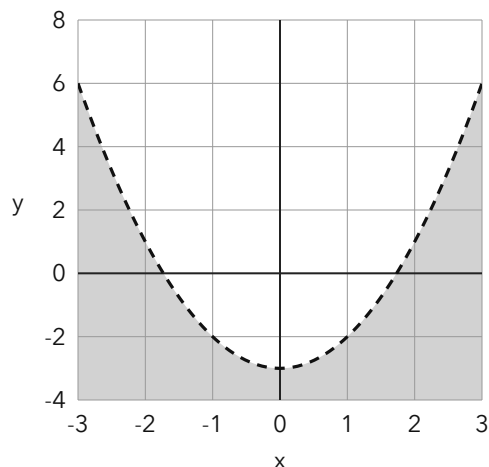
PRACTICE 4

$$y < 5x^2 - 7$$



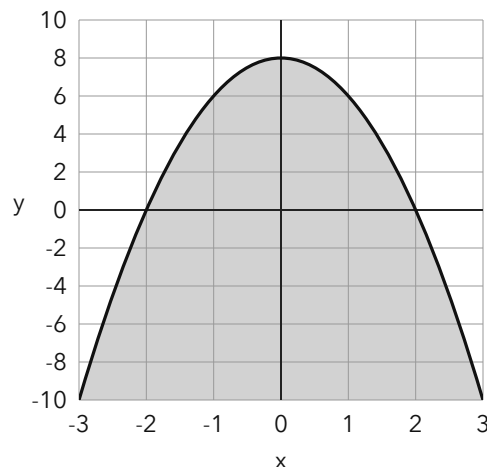
APPLY IT 1

$y < x^2 - 3$ The parabola is $y = x^2 - 3$. The shaded region is below a dashed boundary, so use $<$.



APPLY IT 2

$y \leq -2x^2 + 8$ The region is below the path. Because the path is solid, include it with $\leq$.



CHALLENGE

$y < -3x^2 + 12$ and $-2 \leq x \leq 2$

Accept equivalent reversed inequalities. Graphs in practice 1 and 2 and the bonus-zone task must be interpreted from the actual boundary and shading. Solid means equality is included; dashed excludes it. Shading determines greater or less. Require both the quadratic inequality and inclusive x restriction for the challenge. The key's graphs illustrate the inequalities; viewport edges impose no additional restrictions.

